

## CLAIMS

We Claim:

1. A system for managing quality of service (QoS) for traffic flows generated by a plurality of hosts separated by one or more networks wherein at least one of the networks is enabled with a set of traffic classes, said system comprising:

a services manager, and

a middleware module at at least one of the plurality of hosts, wherein said middleware module at the one host receives a QoS request for a traffic flow the host generates and conveys the QoS provisioning request to the services manager upon receiving the QoS request for the traffic flow, and

wherein said services manager receives the QoS provisioning request from said middleware module, obtains a DSCP (Differentiated Services Code Point) value for the traffic flow if the networks the traffic flow traverses can support the flow, and if a DSCP value is obtained, conveys the obtained DSCP value for the traffic flow to said middleware module, and

wherein said middleware module uses the obtained DSCP value received from the services manager to mark the DSCP field of packets of the traffic flow.

2. The system of claim 1 wherein the services manager, upon receiving the QoS provisioning request, determines the networks the traffic flow traverses, and as part of obtaining the DSCP value further determines if for each traffic class enabled network the traffic flow traverses there is sufficient bandwidth in a traffic class to support the traffic flow.

3. The system of claim 1 wherein the QoS request contains an identification of the traffic flow and wherein the middleware module conveys this identification to the services manager as part of the QoS provisioning request, and

wherein the services manager, upon receiving the QoS provisioning request, determines a default traffic flow characterization for the traffic flow based on the traffic flow identification, and uses the default traffic flow characterization to obtain a DSCP value by determining if the networks the traffic flow traverses can support the flow based on the characterization.

4. The system of claim 3 wherein if the services manager cannot obtain a DSCP value based on the determined default traffic flow characterization, the services manager determines an alternate traffic flow characterization for the traffic flow based on the traffic flow identification, and uses the

determined alternate traffic flow characterization to obtain a DSCP value by determining if the networks the traffic flow traverses can support the flow based on the alternate characterization.

5. The system of claim 1 further comprising a policy enforcement module at at least one of the plurality of hosts, wherein the one host containing the policy enforcement module generates a second traffic flow, and wherein

said middleware module receive a QoS request for the second traffic flow and conveys a QoS provisioning request to the services manager upon receiving the QoS request for the second traffic flow,

said services manager obtains a DSCP value for the second traffic flow if the networks the second traffic flow traverses can support the flow, and if a DSCP value is obtained, conveys the obtained DSCP value for the second traffic flow to the policy enforcement module, and

wherein said policy enforcement module uses the obtained DSCP value received from the services manager to mark the DSCP field of packets of the second traffic flow.

6. The system of 5 wherein the services manager further conveys, when a DSCP value is obtained for the second traffic flow, packet policing and packet shaping instructions to the policy enforcement module, and

wherein the policy enforcement module uses the packet policing and packet shaping instructions received from the services manager to police and shape the packets of the second traffic flow.

7. The system of claim 1 further comprising a policy enforcement module at the one host, and wherein

when a DSCP value is obtained for the traffic flow, said services manager further conveys packet policing and packet shaping instructions to the policy enforcement module, and

the policy enforcement module uses the packet policing and packet shaping instructions received from the services manager to police and shape the packets of the traffic flow.

8. A services manager for managing quality of service (QoS) for traffic flows generated by a plurality of hosts interconnected by one or more networks wherein at least one of the networks is enabled with a set of traffic classes, said services manager comprising:

means for receiving a QoS provisioning request for any given traffic flow,

means for determining traffic attributes for the given traffic flow,

means for obtaining a DSCP (Differentiated Services Code Point) value for the given traffic flow based on whether the networks the traffic flow traverses can support the flow given the determined traffic attributes,

means for conveying an obtained DSCP value to a first of two hosts when the traffic flow is from a first to a second host.

9. The services manager of claim 8 wherein the conveying means further conveys the obtained DSCP value to the second host when the traffic flow is from the second to the first host.

10. The services manager of claim 8 further comprising a topology database for determining which of the one or more networks the given traffic flow traverses, and wherein the obtained DSCP value corresponds to a determined network.

11. The services manager of claim 8 wherein the DSCP obtaining means comprises a network control module for interfacing one or more network control systems wherein each network control system corresponds to a network that has an enabled set of traffic classes and wherein each network control system performs admission control for that network by determining if a given traffic class corresponding to the determined traffic attributes has sufficient available bandwidth to support the traffic flow and, if so, returns a DSCP value for that traffic class.

12. The services manager of claim 11 wherein the DSCP obtaining means further comprises one or more SLA (service level agreement) control modules wherein each SLA control module corresponds to a network to which the plurality of hosts have a service level agreement for an enabled set of traffic classes and wherein each SLA control module performs admission control over the service level agreement for its corresponding network by determining if a given traffic class within the service level agreement and corresponding to the determined traffic attributes has sufficient available bandwidth to support the traffic flow and, if so, returns a DSCP value for that traffic class.

13. The services manager of claim 8 wherein the traffic attribute determining means comprises

a default QoS database with a plurality of default traffic flow characterizations, and  
wherein the traffic attribute determining means uses the database to determine a default traffic flow characterization for the given traffic flow and converts the determined default traffic flow characterization to the traffic attributes.

14. The services manager of claim 13 wherein the traffic attributes determining means further comprises an alternate QoS database with a plurality of alternate traffic flow characterizations, wherein the traffic attribute determining means uses the alternate QoS database to determine an alternate traffic flow characterization and thereby alternate traffic attributes, and wherein if the DSCP obtaining means cannot determine a DSCP value given the determined traffic attributes, said obtaining means obtains a DSCP value for the given traffic flow based on whether the networks the traffic flow traverses can support the flow given the determined alternate traffic attributes.

15. A system at a host for managing quality of service (QoS) for a plurality of traffic flows traversing one or more networks wherein at least one of the networks is enabled with a set of traffic classes, said system comprising:

a middleware control module for receiving QoS provisioning requests for the plurality of traffic flows and for conveying the requests to a services manager intended for determining which of the one or more networks any given traffic flow of the plurality of traffic flows traverses and for obtaining a DSCP (Differentiated Services Code Point) value that corresponds to a determined network that is traffic class enabled and is the first network the any given traffic flow traverses, and wherein the middleware control module is for receiving the determined DSCP values for one or more of the traffic flows generated by the host, and

means responsive to the middleware control module for using the DSCP values for the one or more of the traffic flows generated by the host to mark the transmitted packets corresponding to these traffic flows.

16. The system of claim 15 further comprising a policy enforcement module for policing and packet shaping the transmitted packets corresponding to one or more of traffic flows generated by the host.

17. A system at a host for managing quality of service (QoS) for a plurality of traffic flows traversing one or more networks wherein at least one of the networks is enabled with a set of traffic classes, said system comprising:

a signaling client for generating QoS provisioning requests for one or more of the plurality of traffic flows,

a middleware control module for receiving the QoS provisioning requests and for conveying the requests to a services manager intended for determining which of the one or more networks any given traffic flow of the plurality of traffic flows traverses and for obtaining a DSCP (Differentiated

Services Code Point) value that corresponds to a determined network that is traffic class enabled and is the first network the any given traffic flow traverses, and

a policy enforcement module for receiving the determined DSCP values for the one or more of the plurality of traffic flows that are generated by the host wherein said policy enforcement module uses the DSCP values to mark the transmitted packets corresponding to the one or more of the plurality of traffic flows that are generated by the host.

18. The system of claim 17 wherein the policy enforcement module further configures the host to perform packet policing and packet shaping of the transmitted packets corresponding to the one or more of the plurality of traffic flows that are generated by the host.

19. A method for managing quality of service (QoS) for traffic flows generated by a plurality of hosts interconnected by one or more networks wherein at least one of the networks is enabled with a set of traffic classes, said method comprising:

- receiving a QoS provisioning request for any given traffic flow,
- determining traffic attributes for the given traffic flow,
- obtaining a DSCP (Differentiated Services Code Point) value for the given traffic flow based on whether the networks the traffic flow traverses can support the flow given the determined traffic attributes,
- conveying an obtained DSCP value to a first of two hosts when the traffic flow is from a first to a second host.

20. The method 19 further comprising the step of conveying the obtained DSCP value to the second host when the traffic flow is from the second to the first host.

21. The method of claim 19 further comprising after said determining step the step of a determining which of the one or more networks the given traffic flow traverses, and wherein the obtained DSCP value corresponds to a determined network.

22. The system of claim 19 wherein the traffic attributes determining step comprises the steps of:

- determining a default traffic characterization for the given traffic flow based on a flow identification in the provisioning request, and
- converting the default traffic characterization into the traffic attributes.

23. The method of claim 22 comprising further steps executed in the event a DSCP value is not obtained given the determined traffic attributes, said further steps comprising:

- determining an alternate traffic flow characterization for the given traffic flow,
- converting the default traffic characterization into alternate traffic attributes,
- obtaining a DSCP value for the given traffic flow based on whether the networks the traffic flow traverses can support the flow given the determined alternate traffic attributes.

24. A method executed by a first host for managing quality of service (QoS) for a plurality of traffic flows traversing one or more networks wherein at least one of the networks is enabled with a set of traffic classes, said method comprising:

- receiving a QoS provisioning request for any given traffic flow,
- conveying the request to a services manager intended for determining which of the one or more networks the any given traffic flow traverses and for obtaining a DSCP (Differentiated Services Code Point) value corresponding to a determined network that is traffic class enabled and is the first network the traffic flow traverses,
- receiving the determined DSCP value when the given traffic flow is generated by the host,
- and
- marking the transmitted packets of the given traffic flow with the DSCP value.

25. The method of claim 24 further comprising the step of policing and shaping the transmitted packets of the given traffic flow with the DSCP value